

ROAD SAFETY AUDIT

Pleasant Lake Avenue (Route 124) at Queen Anne Road

Town of Harwich

September 2025

Prepared For:



On Behalf of:
Pine Oaks Village Homes

Prepared By:



Transportation Engineers & Planners

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Background

The Federal Highway Administration (FHWA) defines a Road Safety Audit (RSA) as the formal safety examination of an existing or future road or intersection by an independent, multidisciplinary team. The purpose of an RSA is to identify potential safety issues and possible opportunities for safety improvements, considering all roadway users.

Conducting this RSA was a condition of approval for the Pine Oaks Village multifamily residential development to be located off Queen Anne Road and Main Street in Harwich, Massachusetts. During the local approval process, the RSA was offered as mitigation, which was accepted by the Town and made a condition of approval. It should also be noted that another proposed 60-unit residential development is planned for the northeast corner of the intersection. In an effort to advance safety improvements at these locations, the proponent facilitated this RSA to identify short-term, mid-term, and long-term potential safety improvement strategies for the study area.

Project Data

The RSA was conducted on September 11, 2025, at the Harwich Public Safety Facility located at 183 Sisson Road in Harwich, Massachusetts. The RSA Meeting Agenda is provided in Appendix A. Participating audit team members and their affiliation are listed in Table 1, with team member contact information provided in Appendix B. RSA team members were encouraged to visit the location prior to the meeting to observe operations and evaluate potential safety issues, using MassDOT's Safety Review Prompt list for guidance. Prior to the meeting, team members were provided with the following materials:

1. Collision diagrams,
2. Crash data summary tables,
3. Crash data summary charts analyzing motor vehicle crashes reported within the review period (2017-2021), and
4. Vehicle Speed Data on Queen Anne Road.

This material was reviewed by the audit team at the September 11, 2025 meeting.

Table 1: Participating Audit Team Members

| Audit Team Member | Agency/Affiliation |
|--------------------------|--|
| Derek Jackson | MassDOT District 5 Projects |
| Dakota DelSignore | MassDOT Traffic & Safety Engineering |
| Aleksander Pelletier | MassDOT District 5 Projects |
| Elijah Doubleday | MassDOT District 5 Projects |
| Mojtaba Moharrer | MassDOT District 5 Traffic |
| Linda Cebula | Town of Harwich Traffic Safety Committee Chair |
| Dave Nolan | Cape Cod Commission |
| Steven Tupper | Cape Cod Commission |
| Lincoln Hooper | Town of Harwich Department of Public Works |
| Sydney Mis | MassDOT District 5 Traffic |
| Christine Flynn | Town of Harwich Planning Department |
| Kevin Considine | Harwich Police Department |
| David LeBlanc | Harwich Fire Department |
| Aram Goshgarian | Harwich Police Department |
| Derek Roach | Vanasse & Associates Inc |
| Thomas Hannon | Vanasse & Associates Inc |

Motor vehicle crash data was obtained for the years 2017-2021 and supplemented by the MassDOT IMPACT crash data portal. All reported collisions that involved police dispatch were handled by the Town of Harwich Police Department.

This location reported 23 crashes over the five-year review period, averaging 4.6 crashes per year, with 12 crashes (52%) resulting in property damage only and 11 (48%) resulting in personal injury or possible injury. No fatalities were reported. A total of 10 (43%) were rear-end crashes, 10 (43%) were angle crashes, and 3 (13%) were single-vehicle crashes. The majority of the crashes, 20 (87%) occurred on dry pavement, and 3 (13%) occurred on wet pavement; 16 (70%) occurred during clear weather, 4 (17%) occurred in cloudy weather, 2 (9%) occurred in rainy weather, and 1 occurred in snowy weather. The majority of crashes

occurred between 8:00 and 10:00 AM (5 crashes) and 2:00 to 6:00 PM (11 crashes); 21 (92%) occurred during daylight, while 1 occurred during dawn and 1 at night when the roadway was lit. The highest percentage of crashes occurred in August with 6 crashes (27%).

Project Location and Description

Pleasant Lake Avenue (Route 124)

Pleasant Lake Avenue (Route 124) is a two-lane principal arterial roadway under the jurisdiction of the Town of Harwich south of Queen Anne Road and under the jurisdiction of MassDOT north of Queen Anne Road within the vicinity of the Route 6 interchange. Pleasant Lake Avenue (Route 124) traverses the study area in a general north-south orientation and provides one lane of travel in each direction, with additional left-turn lanes provided at intersections. No sidewalks are provided within the study area. Pleasant Lake Avenue (Route 124) provides 2-foot-wide shoulders. The posted speed limit is 40 mph south of the intersection, which is in accordance with the speed limit established by Special Speed Regulation #598. North of the intersection the speed limit is 45 mph, however, speed limit signage is not posted. Illumination is provided via streetlights on utility poles. Land use along Pleasant Lake Avenue (Route 124) in the vicinity of the study area consists primarily of residential properties with some commercial uses. Pleasant Lake Avenue (Route 124) provides connections to Route 6 to the north (approximately 450 feet) and Main Street to the south (approximately 1.2 miles).

Queen Anne Road

Queen Anne Road is a two-lane minor arterial roadway under the jurisdiction of the Town of Harwich and traverses the study area in a general east-west orientation. Queen Anne Road provides one lane of travel in each direction. No sidewalks are provided within the study area. Queen Anne Road provides 1- to 2-foot-wide shoulders. According to Special Speed Regulation #598-A, the speed limit for Queen Anne Road in the vicinity of the intersection with Pleasant Lake Avenue (Route 124) is 25 mph in both directions, however signage is not posted. Further east of the study area, the speed limit is posted at 35 mph and further west the speed limit is posted at 30 mph, which is in accordance with the special speed regulation for Queen Anne Road. Illumination is provided via streetlights on utility poles. Land use along Queen Anne Road in the vicinity of the study area consists primarily of residential properties with some commercial uses. Queen Anne Road provides connections to Route 137 to the east and Main Street to the west.

Pleasant Lake Avenue (Route 124) at Queen Anne Road

Pleasant Lake Avenue (Route 124) is intersected by Queen Anne Road from the east and west to form a four-way intersection under traffic signal control. The Pleasant Lake Avenue (Route 124) northbound approach provides an exclusive left-turn lane, a shared through/right-turn lane, and a striped shoulder. The Pleasant Lake Avenue (Route 124) southbound approach provides one exclusive left-turn lane, a shared through/right-turn lane, and a striped shoulder. The Queen Anne Road eastbound approach provides one general-purpose travel lane and a marked shoulder. The Queen Anne Road westbound approach provides one general-purpose travel lane and a marked shoulder. Figure 1 depicts the intersection of Pleasant Lake Avenue (Route 124) at Queen Anne Road in relation to the surrounding area.



Figure 1: Locus Map

Audit Observations and Potential Safety Enhancements

Prior to a field visit, a brief introduction of the RSA process and a summary of the crash history were presented to audit participants. Following this presentation, audit team members were encouraged to utilize their local knowledge and expertise to discuss any existing issues affecting safety at the location. The audit team then conducted a site visit of the study location during non-peak hours, where observations of safety concerns and deficiencies were discussed and documented. Following the RSA site visit, audit team members returned to the meeting room at the Harwich Public Safety Facility, where a group discussion was held on the various safety issues and potential safety enhancements. The safety issues observed are summarized and described in more detail in the following section, along with summaries of potential safety enhancements. Some of the safety issues and suggested enhancements may require further study and engineering judgment to determine the feasibility of implementing the enhancements.

Safety Issue No. 1 – Signage:

It was noted prior to the field visit by audit team members that the crash data indicated driver inattention was a contributing factor in crashes 3, 9, 14, 16, 20, and 21. Team members thought this may be due to inadequate warning for the traffic signal. It was noted that all the approaches to the intersection are lacking advanced signal warning signs. Further confusing drivers may be the unsignalized intersection warning (W2-1) sign in addition to a non-MUTCD compliant "Dangerous Intersection Ahead" sign, located on Pleasant Lake Avenue (Route 124), approximately 500 feet south of the intersection with Queen Anne Road. In addition, team members noted that 2 crashes involved a school bus stopping on Pleasant Lake Avenue (Route 124) south of Queen Anne Road (crashes 9 and 14). Team members thought this might also be due to the lack of warning signage for the bus stop. During the field visit, team members confirmed the lack of traffic signal warning signs or bus stop signs. In addition, team members noted the presence of a horizontal curve on Pleasant Lake Avenue (Route 124) just prior to the bus stop. This curvature, coupled with the lack of appropriate signage, could be contributing to the lack of awareness of the bus stop and traffic signal.

Lastly, during the site visit, audit team members noted that the regulatory speed limit sign on Pleasant Lake Avenue (Route 124) southbound was located just south of Queen Anne Road and visible at the intersection. Regulatory speed limit signs are not typically placed in an intersection like this and may not be effectively informing drivers of the roadway speed limit. This could contribute to sign clutter at the intersection and be overlooked by drivers as they navigate the intersection. Additionally, the placement may encourage higher speeds to continue through the intersection. Figure 2 depicts the location of the speed limit sign.



Figure 2: Speed Limit Sign on Pleasant Lake Avenue (Route 124) just south of Queen Anne Road

In addition, audit team members noted that the speed regulation for Pleasant Lake Avenue (Route 124) indicates the speed limit is 45 mph north of Queen Anne Road, but there are no signs posted. Similarly, Queen Anne Road's speed regulation indicates a 25 mph speed limit within the vicinity of the intersection with Pleasant Lake Avenue (Route 124), but there are no signs posted. Also, as shown in Figure 2, the street name signs are mounted on the side of the mast arms on the northeast and southwest corners of the intersection. These may not be placed in a location that is easily visible to drivers. The lack of speed limit signage or the improper placement may contribute to a range of speeds that vehicles are traveling. Keeping a uniform speed on a roadway allows for drivers to react better situations as all drivers are moving slowly relative to each other.

Potential Safety Enhancements:

1. Consider installing advanced signal warning signs on all approaches to the intersection to provide notice of the upcoming traffic signal.
2. Remove the non-compliant unsignalized intersection warning (W2-1) sign on Pleasant Lake Avenue (Route 124).
3. Investigate and consider installing bus signage for the bus stop on Pleasant Lake Avenue (Route 124) south of Queen Anne Road to provide notice of the upcoming bus stop.
4. Evaluate the regulatory speed limit sign placement on Pleasant Lake Avenue (Route 124) for optimal locations.
5. Confirm existing speed limit signage matches the speed regulations for Pleasant Lake Avenue

(Route 124) and Queen Anne Road, and add/replace signs as needed.

6. Evaluate all existing signage within the study area and remove, modify, or relocate signs that are non-compliant with the MUTCD, repetitive, non-essential, or conflicting.

Safety Issue No. 2 – Lighting and Traffic Signal Visibility:

The crash data indicated that 1 crash occurred under dark conditions and another occurred during dawn. Lighting in the area is provided by a streetlight mounted on a utility pole at the southeast corner of the intersection. Since the only streetlight is on the southeast corner, it may not directly illuminate the center of the intersection, which may be contributing to the nighttime crashes, specifically crashes 4 and 22. During the field visit, audit team members noted that the traffic signal heads did not have retroreflective strips on the back plates. Figure 3 depicts the traffic signal heads without retroreflective strips on the back plates.



Figure 3: Traffic Signal Heads – No Retroreflective Strips on Backplates

This may be a contributing factor in the 10 rear-end collisions that occurred during the study period, as drivers may not be seeing the signal in time. Audit team members also noted that a tree on the property on the north corner of the intersection blocks visibility of one of the signal heads, so drivers on Queen Anne Road westbound can only see one of the two signal heads approaching the intersection. The lack of signal visibility may have contributed to the high number of rear-end crashes, specifically crashes 3, 19, 20, and 22. Figure 4 shows a view of the traffic signal from the Queen Anne Road westbound perspective.



**Figure 4: Drivers View of Traffic Signal Head
Obstructed – Queen Anne Road Westbound**

Potential Safety Enhancements:

1. Evaluate the adequacy of the existing lighting at the intersection and install additional lighting as needed.
2. Consider installing retroreflective strips on the backplates of all traffic signal heads at the intersection to improve signal visibility.
3. Consider trimming the tree on the north corner of the intersection such that both signal heads are visible to drivers approaching the intersection on Queen Anne Road westbound.

Safety Issue No. 3 – Pedestrian/Bicycle Facilities:

Prior to the field visit, audit team members noticed that there are no pedestrian or bicyclist accommodations provided at this intersection or along any of its approaches. Team members also noted that the Cape Cod Rail Trail crosses Queen Anne Road approximately 0.5 miles west of Pleasant Lake Avenue (Route 124). Team members also noted that it is difficult to safely pass bicyclists on Queen Anne Road and Pleasant Lake Avenue (Route 124) as the shoulders are narrow. After the field visit, an audit team member suggested that more pedestrians and bicyclists may wish to travel through this intersection when the proposed residential developments in the area are completed.

Potential Safety Enhancements:

1. Consider constructing complete street design elements to improve the intersection for pedestrian and bicycle use.

2. Consider installing ADA-compliant pedestrian accommodations at the intersection.
3. Consider providing bicyclist accommodations at the intersection.
4. Investigate pedestrian/bicyclist desire lines in the area, including the impact from the proposed residential developments in the area to inform the need for future accommodations in the study area.

Safety Issue No. 4 – Signal Timing and Phasing:

Audit team members noted that the Pleasant Lake Avenue (Route 124) southbound approach has protective/permissive left-turn phasing, while the northbound approach only has permissive phasing for left turns. Figure 5 shows the Pleasant Lake Avenue (Route 124) southbound left-turn signal head.



Figure 5: Pleasant Lake Avenue (Route 124) Southbound Approach Left-Turn Signal Head - Circle Green Indication

Similarly, Queen Anne Road only has permissive left-turn phasing. The phasing may be a contributing factor in the angle crashes involving left-turning vehicles (crashes 7, 15, and 17) as the vehicle with permissive phasing failed to yield the right-of-way to the through vehicle in all three instances. It was also noted that the permissive left-turn movement on Pleasant Lake Avenue (Route 124) southbound uses a solid green signal indication and not a flashing yellow arrow signal indication. This may also be a contributing factor in crashes 7 and 17, as this may lead to drivers thinking they have the right-of-way.

In addition, a nearby resident approached the team during the field visit to state that the Queen Anne Road eastbound approach backs up regularly. Team members also indicated that backups occur on Pleasant Lake Avenue (Route 124) northbound and that the left-turn lane on Pleasant Lake Avenue (Route 124) southbound backs up beyond its storage lane. Also, team members indicated limited gaps are available in traffic for left-turning vehicles. This may lead to driver inattention/distraction/or frustration, which could be a contributing factor in both rear-end collisions (crashes 2, 3, 9, 10, 11, 12, 14, 19, 20, and 22) and in red light running crashes (crashes 4, 5, and 21) at the intersection. Inadequate clearance intervals may also be a factor in red light running crashes, as vehicles may be accelerating through the intersection in an attempt to beat the red signal and are unable to clear the intersection in time

Potential Safety Enhancements:

1. Evaluate traffic signal timings and adjust as needed for optimal performance.
2. Evaluate the clearance intervals for the intersection and update as needed.
3. Evaluate the left-turn signal phasing at the intersection:
 - a. Consider implementing protected-only left-turn phasing on Pleasant Lake Avenue (Route 124) at the intersection to reduce conflicts.
 - b. Should phasing remain unchanged, consider upgrading the signal to a flashing yellow arrow in order to further clarify the permissive left-turn phase to drivers.
4. Evaluate the adequacy of the left-turn lane storage on Pleasant Lake Avenue (Route 124) southbound and modify the storage length as needed.

Safety Issue No. 5 – Intersection Design and Geometry:

Prior to the field visit, audit team members noted that all approaches have limited sight distance for right turns, but a NO TURN ON RED restriction was only implemented on the Queen Anne Road eastbound approach for operational reasons. This is likely a contributing factor for crash 23, where the driver failed to yield the right-of-way when turning right on red from Queen Anne Road westbound onto Route 124 northbound. As mentioned previously, it was noted anecdotally that Queen Anne Road experiences long queues due to vehicles wanting to turn left. They must wait for a gap in traffic and, as a result, block the travel lane for vehicles wishing to continue through or turn right, which can lead to long queues and delays. This may be a contributing factor in rear-end crashes on Queen Anne Road (crashes 2, 12, and 19).

During the site visit, audit team members noted that larger vehicles seemed to have difficulty turning through the intersection. It appears the STOP bar on the Pleasant Lake Avenue (Route 124) southbound approach is purposefully set back from the intersection to allow for larger vehicles to turn without encroaching on vehicles stopped on Pleasant Lake Avenue (Route 124) southbound at the signal. Even with the STOP bar set back, team members notice large vehicles having difficulty making their turn. Audit team members observed several objects in the clear zone that should be evaluated. This includes the guy wire for a utility pole and two guardrails, which may present additional safety issues should a vehicle depart at the intersection. Lastly, audit team members noted that the existing drainage system on Queen Anne Road had only one catch basin that was full. This could lead to drainage issues.

Potential Safety Enhancements:

1. Consider implementing NO TURN ON RED restrictions on all approaches.
2. Consider installing left-turn lanes on Queen Anne Road if warranted. Left-turn lanes may allow left-turn vehicles to stack separately from through movements.
3. Evaluate design vehicle critical movements and consider modifying curb radii as needed.
4. Consider staggering STOP bars for left-turn lanes to allow larger vehicles to turn without impeding

oncoming traffic.

5. Evaluate relocating objects in the clear zone.
6. Evaluate adequacy of the drainage system and current maintenance schedule along Queen Anne Road and Pleasant Lake Avenue (Route 124).

Safety Issue No. 6 – Speed

Prior to the field visit, audit team members noted that the vehicle travel speed on Queen Anne Road made it difficult for drivers to exit from side streets. Audit team members also noted that vehicles exit Route 6 traveling at a high speed and carry that speed to the intersection. Speed data collected on Queen Anne Road west of Pleasant Lake Avenue (Route 124) indicates that the average speed is 33 mph which is 8 mph above the speed regulation of 25 mph west of Pleasant Lake Avenue (Route 124). Vehicle speeds may be a contributing factor in the 11 injury crashes (crashes 1, 2, 4, 7, 10, 11, 12, 13, 14, 20, and 21). During the field visit, vehicles were observed to accelerate through turns at the end of the cycle. This could be attributed to accepting inadequate gaps in traffic due to driver frustration from long cycle lengths as discussed earlier.

Potential Safety Enhancements:

1. Consider installing speed feedback signs to discourage speeding.
2. Consider implementing speed management countermeasures within the study area and at the intersection to reduce vehicle speeds.

Summary of Road Safety Audit

The RSA team identified safety issues and potential safety enhancements for the study area under review, based on the on-site field observations, meeting discussion, and a review of available crash data. Table 2 lists estimated timeframes and construction costs for each category (for timeframe: short-, mid-, and long-term, and for costs: low, medium, and high).

Table 2: Estimated Time Frame and Costs Breakdown

| Time Frame | Time | Cost Frame | Costs |
|-------------------|-------------|-------------------|-------------------|
| Short-Term | <1 Year | Low | <\$10,000 |
| Mid-Term | 1-3 Years | Medium | \$10,001-\$50,000 |
| Long-Term | >3 Years | High | >\$50,000 |

Safety payoffs were based on engineering judgment for improvement strategies considered in the RSA.

Tables 3-5 provide a summary of the Potential Safety Enhancements discussed during the audit, along with the potential safety payoffs, the estimated time frame for completion, the estimated construction cost, and the roadway jurisdiction.

The jurisdiction listed in Tables 3-5 refers to the ownership of the roadways. It does not indicate who is responsible for implementing improvements.

Table 3: Potential Safety Enhancement Summary

| Safety Issue | Potential Safety Enhancement | Safety Payoff | Time Frame | Cost | Jurisdiction ^a |
|--------------|---|---------------|------------|------|-----------------------------|
| Signage | Consider installing advanced signal warning signs on all approaches to the intersection to provide notice of the upcoming traffic signal. | Low | Short-Term | Low | Town of Harwich/ MassDOT |
| | Remove the improper unsignalized intersection warning (W2-1) sign on Pleasant Lake Avenue (Route 124). | Low | Short-Term | Low | Town of Harwich |
| | Investigate bus signage for the bus stop on Pleasant Lake Avenue (Route 124) south of Queen Anne Road to provide notice of the upcoming bus stop. | Low | Short-Term | Low | Town of Harwich |
| | Evaluate the regulatory speed limit sign placement on Pleasant Lake Avenue (Route 124) for optimal locations. | Low | Short-Term | Low | Town of Harwich/ MassDOT |
| | Confirm existing speed limit signage matches the speed regulations for Pleasant Lake Avenue (Route 124) and Queen Anne Road, and add/replace signs as needed. | Low | Short-Term | Low | Town of Harwich/ MassDOT |
| | Evaluate all existing signage within the study area and remove, modify, or relocate signs that are non-compliant with the MUTCD, repetitive, non-essential, or conflicting. | Low | Short-Term | Low | Town of Harwich/ MassDOT |

^aJurisdiction refers to the ownership of the roadways. It does not indicate who is responsible for implementing improvements.

Table 4: Potential Safety Enhancement Summary

| Safety Issue | Potential Safety Enhancement | Safety Payoff | Time Frame | Cost | Jurisdiction ^a |
|--|--|---------------|--------------------|-----------------|-----------------------------|
| Lighting and Traffic Signal Visibility | Evaluate the adequacy of the existing lighting at the intersection and install additional lighting as needed. | Medium | Short/ Mid-Term | Medium/ High | Town of Harwich/ MassDOT |
| | Consider installing retroreflective strips on the backplates of all traffic signal heads at the intersection to improve visibility. | Medium | Short-Term | Low | Town of Harwich |
| | Consider trimming the tree on the north corner of the intersection such that both signal heads are visible to drivers approaching the intersection on Queen Anne Road westbound. | Low | Short-Term | Low | Town of Harwich |
| Pedestrian/Bicycle Facilities | Consider constructing complete street design elements to improve the intersection for pedestrian and bicycle use. | Medium | Long-Term | Medium/ High | Town of Harwich/ MassDOT |
| | Consider installing ADA-compliant pedestrian accommodations at the intersection. | Medium | Mid-Term | Medium/ High | Town of Harwich/ MassDOT |
| | Consider providing bicyclist accommodations at the intersection. | Medium | Long-Term | Medium/ High | Town of Harwich/ MassDOT |
| | Investigate pedestrian/bicyclist desire lines, including the impact of proposed residential developments, to inform the need for future accommodations in the study area. | Low | Short-Term | Low | Town of Harwich |

^aJurisdiction refers to the ownership of the roadways. It does not indicate who is responsible for implementing improvements.

Table 3: Potential Safety Enhancement Summary (Continued)

| Safety Issue | Potential Safety Enhancement | Safety Payoff | Time Frame | Cost | Jurisdiction ^a |
|----------------------------------|--|---------------|------------|-----------------|-----------------------------|
| Signal Timing and Phasing | Evaluate traffic signal timings and adjust as needed for optimal performance. | Medium | Short-Term | Low | Town of Harwich |
| | Evaluate the clearance intervals for the intersection and update as needed. | Medium | Short-Term | Low | Town of Harwich |
| | Consider implementing protected-only left-turn phasing on Pleasant Lake Avenue (Route 124) at the intersection to reduce conflicts. | High | Short-Term | Low | Town of Harwich |
| | Should phasing remain unchanged, consider upgrading the signal to a flashing yellow arrow in order to further clarify the permissive left-turn phase to drivers. | Medium | Short-Term | Medium | Town of Harwich |
| | Evaluate the adequacy of the left turn lane storage on Pleasant Lake Avenue (Route 124) southbound and modify the storage length as needed. | Low | Short-Term | Medium | Town of Harwich/ MassDOT |
| Intersection Design and Geometry | Consider implementing NO TURN ON RED restrictions on all approaches. | Medium | Short-Term | Low | Town of Harwich |
| | Consider installing left-turn lanes on Queen Anne Road if warranted. Left-turn lanes may allow left-turn vehicles to stack separately from through movements. | Medium | Mid-Term | Medium/ High | Town of Harwich |

^aJurisdiction refers to the ownership of the roadways. It does not indicate who is responsible for implementing improvements.

Table 3: Potential Safety Enhancement Summary (Continued)

| Safety Issue | Potential Safety Enhancement | Safety Payoff | Time Frame | Cost | Jurisdiction ^a |
|----------------------------------|---|---------------|--------------------|----------------|-----------------------------|
| Intersection Design and Geometry | Evaluate design vehicle critical movements and consider modifying curb radii as needed. | Low | Short-Term | Low | Town of Harwich |
| | Consider staggering STOP bars for left-turn lanes to allow larger vehicles to turn without impeding oncoming traffic. | Low | Short-Term | Low | Town of Harwich |
| | Evaluate relocating objects in the clear zone. | High | Mid/Long-Term | Medium/High | Town of Harwich/ MassDOT |
| | Evaluate adequacy of the drainage system and current maintenance schedule along Queen Anne Road and Pleasant Lake Avenue (Route 124). | Low | Mid-Term | High | Town of Harwich/ MassDOT |
| Speed | Consider installing speed feedback signs to discourage speeding. | Low | Short-Term | Low | Town of Harwich/ MassDOT |
| | Consider implementing speed management countermeasures within the study area and at the intersection to reduce vehicle speeds. | Medium | Short/ Mid-Term | Low/ Medium | Town of Harwich/ MassDOT |

^aJurisdiction refers to the ownership of the roadways. It does not indicate who is responsible for implementing improvements.

Appendix A. RSA Meeting Agenda

Agenda

Road Safety Audit

Harwich

MEETING LOCATION: Harwich Police Department,
EOC Room
(183 Sisson Road)
Harwich, MA

DATE: September 11, 2025
TIME: 11:00 AM – 3:00 PM

Type of Meeting:

Road Safety Audit

Attendees:

Invited Participants to Comprise a Multidisciplinary Team

| | |
|----------|---|
| 11:00 AM | Welcome and Introductions |
| 11:15 AM | Discussion of Safety Issues <ul style="list-style-type: none">• Crash History – Provided in Advance• Existing Geometries and Conditions |
| 12:00 PM | Lunch Break (Not Provided) |
| 12:30 PM | Site Visit <ul style="list-style-type: none">• Drive to Pleasant Lake Avenue at Queen Anne Road• As a group, identify areas for improvement |
| 2:00 PM | Discussion of Potential Improvements` <ul style="list-style-type: none">• Return to Police Department• Discuss observations and finalizes safety issue areas• Discuss potential improvements and finalize recommendations |
| 3:00 PM | Adjourn for the day – but the RSA has not ended |

Instructions for Participants:

- Before attending the RSA on September 11, 2025, participants are encouraged to drive/walk through the locations and complete/consider elements of the RSA Prompt List with a focus on safety
- All participants will be actively involved in the process throughout. Participants are encouraged to come with thoughts and ideas, but are reminded that the synergy that develops and respect for others' opinions are key elements to the success of the overall RSA process.
- After the RSA meeting, participants will be asked to comment and respond to the document materials to assure it is reflective of the RSA completed by the multidisciplinary team.

Safety Review Prompt List

The Safety Review Prompt List provides basic safety-related questions to use when evaluating a given roadway location. The prompt list should be considered when evaluating a roadway to design improvements or conduct a Road Safety Audit. The primary purpose of the prompt list is to identify potential road safety hazards. The list is meant to be general and should be used to prompt an evaluator as to specific matters identified in the field that may have an adverse effect on road safety. The Safety Review Prompt List is not a check of compliance with design standards.

This Prompt List represents the minimum that should be considered when exploring safety opportunities and is not intended to address all aspects of safety.

A summary of the responses should be prepared to highlight potential safety improvement opportunities.

Speed

- Are posted speed limits consistent with speed regulations; are they adequate?
- Are design features consistent with the posted speed (passing opportunities, sight distance, warning signs for horizontal and vertical curves, clearance intervals, sign placement, etc.)?
- Are adequate controls in place for driver compliance with speed limits?

Multi-modal

- Have accommodations been provided for the safe movement of pedestrians, bicycles, emergency vehicles, public transportation, and commercial vehicles?
- What design features could be improved, added, or removed to enhance the safe mobility of the various modes?

Pavement Markings

- Are there highly visible and retro-reflective edge lines, centerlines, and other pavement markings?
- Do the pavement markings provide sufficient guidance to the road users? Can the placement of the pavement markings be modified to improve guidance to road users?

Signs

- Are all signs retro-reflective and visible for all roadway conditions, including placed free from obstructions?
- Are signs located to maximize perception and reaction while minimizing intrusion in clear zones?
- Does the signage provide adequate guidance to road users for given road conditions?

- Are pavement markings and signs consistent in effectively guiding road users?

Intersection Control

- Do all signs (STOP signs, lane assignments, street names, etc.) provide visible, clear, non-conflicting messages?
- Is there clear, non-conflicting visibility of traffic control (signal heads, signs, and markings) from all approach lanes?
- Has the potential of misrepresentation of intersection control been considered (at closely spaced intersections or through control that is against expectation)?
- For signalized intersections, have the implications on safety been considered for the signal phasing?
- Is there a safe means by which all modes can travel through the intersection?

Lighting

- Is lighting (from headlights and/or streetlights) adequate for specific roadway conditions and/or use?
- If glare exists from sunlight or opposing headlights, are there countermeasures that can be implemented to minimize potentially detrimental effects?

Obstructions

- Are there obstructions to sightlines or roadway guidance (signs, markings, etc.) that can be removed, relocated, or minimized as part of this project?
- If obstructions or fixed objects exist but cannot be moved, can they be shielded (with guardrails, etc.) or delineated (with reflectors) to improve road user safety? If so, what can be done?

Pavement

- Could the condition of the pavement impact mobility and safety (potholes, edge drop-offs, skid resistance, etc.)?
- What improvements can be made to minimize safety impacts?

Access Points and Traffic Generators

- Is the access control sufficient for the road's function?
- Are site access points located to maximize safety while still providing adequate access?
- Have impacts of site developments been adequately accommodated for safe mobility of all road users?

Parking

- Is parking clearly delineated and in conformance with signs, markings, and regulations?
- Might parking obstruct mobility/safety of pedestrians and other roadway users?

Weather Conditions

- Have accommodations been made for impacts from adverse weather conditions (storage of snow, removal of ponding, adequate drainage, signage of low salt areas, maintenance program for snow removal, and catch basin clearing, etc.)?

Auxiliary Lanes

- Could taper locations and/or alignments contribute to safety challenges?
- Could lack of climbing lanes or passing zones cause driver frustration?
- Do acceleration/deceleration lane lengths necessitate additional signage and/or markings?

Animals

- Do animal migrations impact safety?
- Can measures be taken to reduce animal-vehicle conflicts?

MAKING OUR ROADS SAFER

One
Countermeasure
at a Time



The FHWA has identified and is promoting widespread use of a set of 28 Proven Safety Countermeasures that can offer significant, measurable impacts as part of any agency's data-driven, systemic approach to improving safety. These strategies are designed to enhance safety on all kinds of roads—from rural to urban, from high-volume freeways to less traveled two-lane State and county roads, from signalized crossings to horizontal curves, and everything in between. Each countermeasure addresses **speed management, intersections, roadway departures, or pedestrians/ bicyclists**—along with crosscutting strategies that address all four safety focus areas.

Which Proven Safety Countermeasures Will You Use?

For more information on this and other FHWA Proven Safety Countermeasures, please visit <https://safety.fhwa.dot.gov/provencountermeasures>.



U.S. Department of Transportation
Federal Highway Administration

ZERO IS OUR GOAL
A SAFE SYSTEM IS HOW WE GET THERE

<https://safety.fhwa.dot.gov/>

Proven Safety Countermeasures

SPEED MANAGEMENT



Speed Safety Cameras
(Currently Cannot Be Applied in MA)



Variable Speed Limits



Appropriate Speed Limits for All Road Users

ROADWAY DEPARTURE



Wider Edge Lines



Enhanced Delineation for Horizontal Curves



Longitudinal Rumble Strips and Stripes on Two-Lane Roads



SafetyEdgeSM



Roadside Design Improvements at Curves



Median Barriers

INTERSECTIONS



Backplates with Retroreflective Borders



Corridor Access Management



Dedicated Left- and Right-Turn Lanes at Intersections



Reduced Left-Turn Conflict Intersections



Roundabouts



Systemic Application of Multiple Low-Cost Countermeasures at Stop-Controlled Intersections



Yellow Change Intervals

PEDESTRIANS/BICYCLES



Crosswalk Visibility Enhancements



Bicycle Lanes



Rectangular Rapid Flashing Beacons (RRFB)



Leading Pedestrian Interval



Medians and Pedestrian Refuge Islands in Urban and Suburban Areas



Pedestrian Hybrid Beacons



Road Diets (Roadway Reconfiguration)



Walkways

CROSSCUTTING



Pavement Friction Management



Lighting



Local Road Safety Plans



Road Safety Audit

Appendix B. RSA Audit Team Contact List

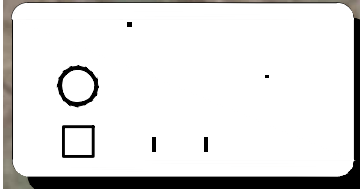
Participating Audit Team Members

Date: September 11, 2025

Location: 183 Sisson Road, Harwich, MA

| Audit Team Members | Agency/Affiliation | Email Address | Phone Number |
|---------------------------|--|--|---------------------|
| Derek Roach | Vanasse & Associates Inc | droach@rdva.com | (978) 269-6827 |
| Thomas Hannon | Vanasse & Associates Inc | thannon@rdva.com | (978) 269-6863 |
| Derek Jackson | MassDOT District 5 Projects | derek.m.jackson@dot.state.ma.us | (617)-699-0044 |
| Dakota DelSignore | MassDOT Traffic & Safety Engineering | Dakota.D.DelSignore@dot.state.ma.us | (857) 274-3389 |
| Aleksander Pelletier | MassDOT District 5 Projects | aleksander.j.pelletier@dot.state.ma.us | (508) 824-6632 |
| Elijah Doubleday | MassDOT District 5 Projects | elijah.a.doubleday@dot.state.ma.us | (413)-520-0365 |
| Mojtaba Moharrer | MassDOT District 5 Traffic | mojtaba.m.moharrer@dot.state.ma.us | (508) 824-6633 |
| Linda Cebula | Town of Harwich Traffic Safety Committee Chair | macebula1@verizon.net | |
| Dave Nolan | Cape Cod Commission | stupper@capecodcommission.org | (508)-744-1226 |
| Steven Tupper | Cape Cod Commission | david.nolan@capecodcommission.org | |
| Lincoln Hooper | Town of Harwich Department of Public Works | lhooper@harwichdpw.com | (508)-430-7555 |
| Sydney Mis | MassDOT District 5 Traffic | Sydney.B.Mis@dot.state.ma.us | |
| Christine Flynn | Town of Harwich Planning Department | christine.flynn@harwich-ma.gov | (508)-430-7511 |
| Kevin Considine | Harwich Police Department | kconsidine@harwichpolice.com | (508)-430-7541 |
| David LeBlanc | Harwich Fire Department | dleblanc@harwich-ma.gov | (508)-430-7546 |
| Aram Goshgarian | Harwich Police Department | agoshgarian@harwich-ma.gov | (978) 269-6827 |

Appendix C. Detailed Crash Data



| CRASH TYPE | | | |
|-------------------|--|-----------------------|--|
| Angle (A) | | Turning Movement (TM) | |
| Rear End (RE) | | Backing Up (BU) | |
| Head On (HO) | | Lane Change (LC) | |
| Fixed Object (FO) | | Out of Control (OC) | |
| Side Swipe (SS) | | Pedest./Bicycle (P/B) | |



Figure 1
Collision Diagram
Pleasant Lake Avenue at
Queen Anne Road
2017 - 2021

| CRASH TYPE | | | | Severity | | Road Surface (R/S) | | Weather (W) | |
|-------------------|--|-----------------------|--|---------------------------|-------------|--------------------|--|-------------|--|
| Angle (A) | | Unknown (U) | | PD = Property Damage Only | 1 = Dry | 1 = Clear | | | |
| Rear End (RE) | | Turning Movement (TM) | | PI = Personal Injury | 2 = Wet | 2 = Cloudy | | | |
| Head On (HO) | | Backing Up (BU) | | F = Fatality | 3 = Snowy | 3 = Rain | | | |
| Fixed Object (FO) | | Lane Change (LC) | | U = Unknown | 4 = Icy | 4 = Snow | | | |
| Side Swipe (SS) | | Out of Control (OC) | | | 5 = Unknown | 5 = Other | | | |
| | | Pedest./Bicycle (P/B) | | | 6 = Slush | 6 = Unknown | | | |

| CRASH # | DATE | DAY | TIME | SEV. | R/S | W | CRASH TYPE | No. Of VEHICLES |
|---------|------------|-----------|----------|------|-----|-----|------------|-----------------|
| 1 | 06/09/2017 | Friday | 7:56 AM | PI | 2 | 2/3 | TM | 2 |
| 2 | 08/04/2017 | Friday | 9:43 AM | PI | 1 | 1 | RE | 2 |
| 3 | 09/28/2017 | Thursday | 5:03 PM | PD | 1 | 1 | RE | 2 |
| 4 | 10/18/2017 | Wednesday | 6:50 PM | PI | 1 | 1 | A | 2 |
| 5 | 03/22/2018 | Thursday | 10:04 AM | PD | 2 | 4 | A | 2 |
| 6 | 06/30/2018 | Saturday | 4:57 PM | PD | 1 | 1 | A | 2 |
| 7 | 08/15/2018 | Wednesday | 7:31 AM | PI | 1 | 2 | TM | 2 |
| 8 | 01/18/2019 | Friday | 3:49 PM | PD | 1 | 2 | TM | 2 |
| 9 | 04/11/2019 | Thursday | 3:58 PM | PD | 1 | 1 | RE | 2 |
| 10 | 07/03/2019 | Wednesday | 12:14 PM | PI | 1 | 1 | RE | 3 |
| 11 | 08/11/2019 | Sunday | 11:28 AM | PI | 1 | 1 | RE | 2 |
| 12 | 08/11/2019 | Sunday | 2:59 PM | PI | 1 | 1 | RE | 2 |
| 13 | 09/14/2019 | Saturday | 8:57 AM | PI | 1 | 1 | OC/FO | 1 |
| 14 | 02/10/2020 | Monday | 3:31 PM | PI | 2 | 3 | RE | 2 |
| 15 | 05/19/2020 | Tuesday | 4:19 PM | PD | 1 | 1 | TM | 2 |
| 16 | 06/06/2020 | Saturday | 5:18 PM | PD | 1 | 1 | OC/FO | 1 |
| 17 | 06/17/2020 | Wednesday | 8:25 AM | PD | 1 | 1 | TM | 2 |
| 18 | 02/12/2021 | Friday | 4:15 PM | PD | 1 | 2 | OC/FO | 1 |
| 19 | 05/28/2021 | Friday | 8:13 AM | PD | 1 | 1 | RE | 2 |
| 20 | 06/08/2021 | Tuesday | 2:36 PM | PI | 1 | 1 | RE | 2 |
| 21 | 08/10/2021 | Tuesday | 9:01 AM | PI | 1 | 2 | A | 2 |
| 22 | 08/16/2021 | Monday | 6:26 AM | PD | 1 | 1 | RE | 2 |
| 23 | 11/10/2021 | Wednesday | 2:47 PM | PD | 1 | 1 | TM | 2 |
| 24 | | | | | | | | |
| 25 | | | | | | | | |
| 26 | | | | | | | | |
| 27 | | | | | | | | |
| 28 | | | | | | | | |
| 29 | | | | | | | | |
| 30 | | | | | | | | |

Figure 2

Collision Data
Pleasant Lake Avenue at
Queen Anne Road



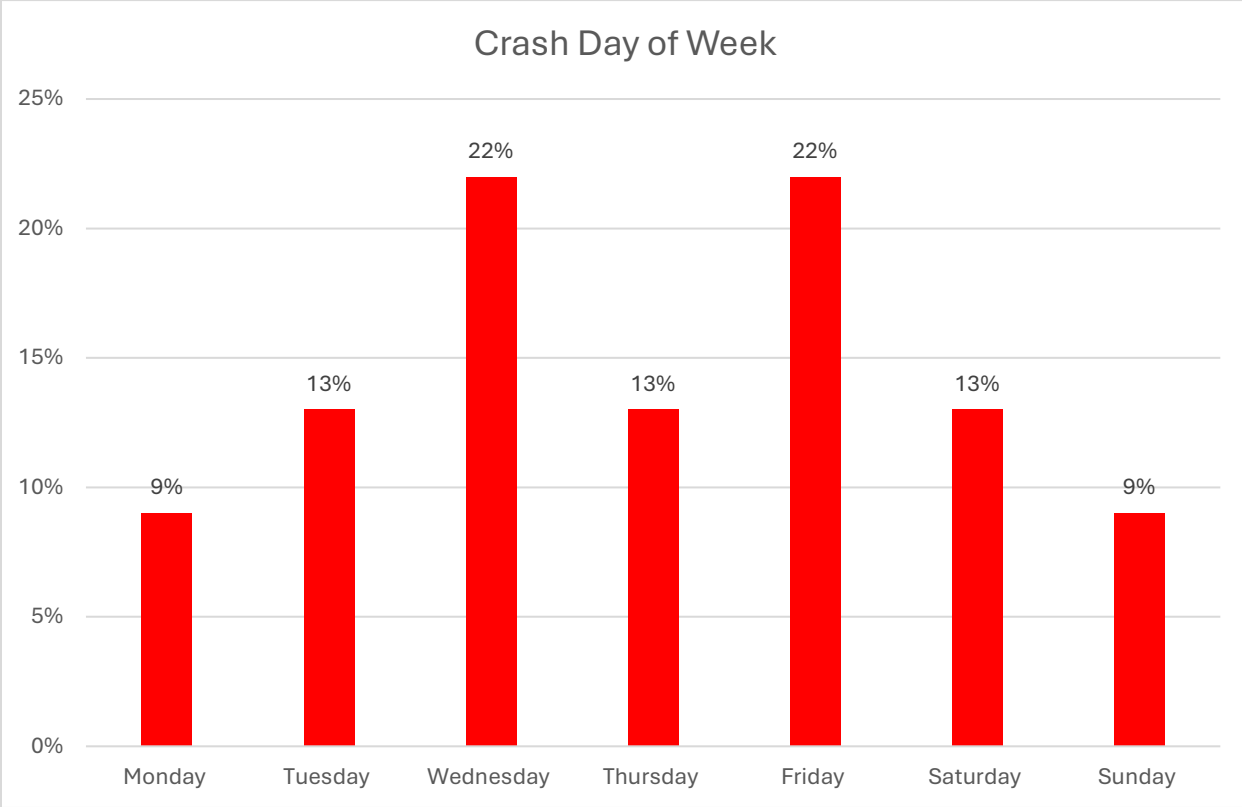
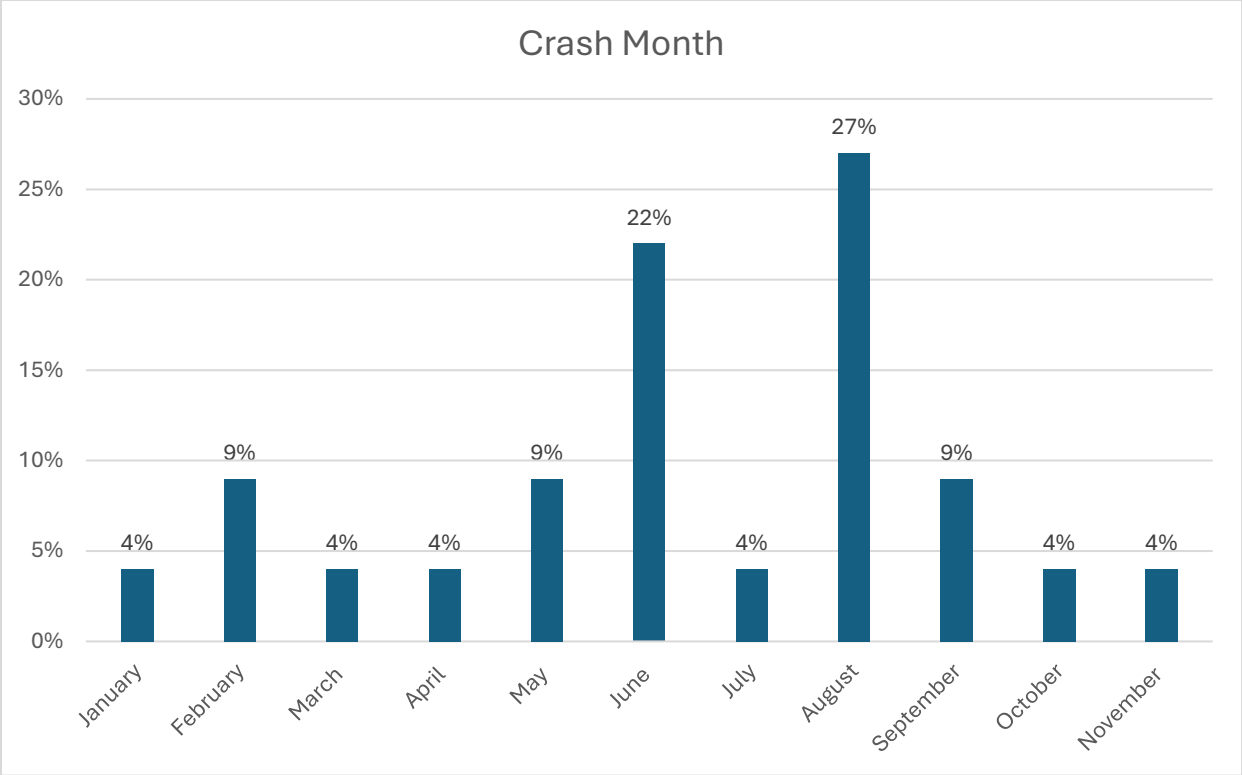
Crash Data Summary
LOCATION: PLEASANT LAKE AVENUE AT QUEEN ANNE ROAD
January 2017 - December 2021

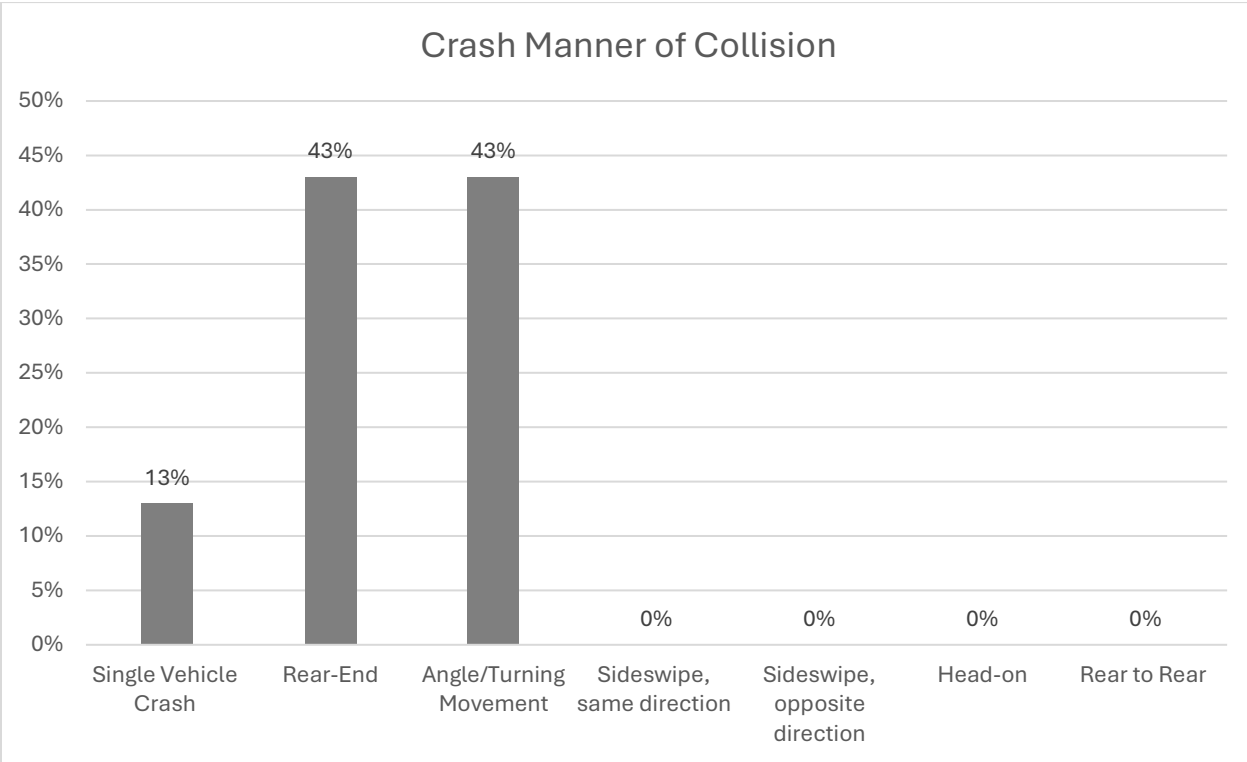
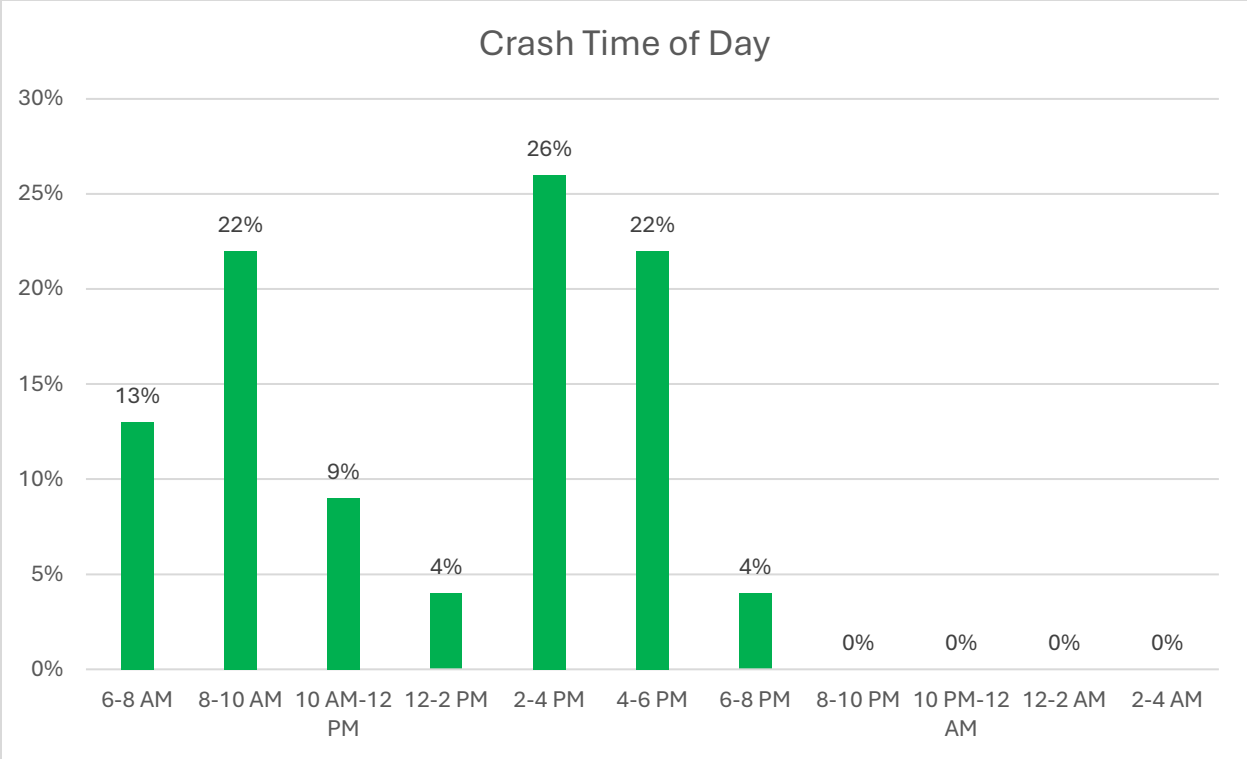
| Crash Diagram Reference # | Crash Date | Crash Day | Crash Time | Manner of Collision | Injury Status | Light Conditions | Weather Conditions | Road Surface Condition | Driver Ages | | | Driver Contributing Circumstances | Comments |
|---------------------------|------------|-----------|------------|---------------------|----------------------|-----------------------|--------------------|------------------------|-------------|----|---------|---|---|
| | | | | | | | | | | | | | |
| 1 | 06/09/2017 | Friday | 7:56 AM | Angle | Injury | Daylight | Rain | Wet | 21 | 33 | | D1: Distracted / D2: (No improper driving) | D2 was stopped at a red light on Route 124 southbound. D1 was turning left from Queen Anne Road onto Route 124 northbound and struck D2. D2 stated they were being tailgated and turned to look while completing the turn. |
| 2 | 08/04/2017 | Friday | 9:43 AM | Rear-end | Injury | Daylight | Clear | Dry | 41 | 68 | | D1: (No improper driving) / D2: (Other improper action, illness) | D1 was stopped at the red light facing east on Queen Anne Road. D2 was stopped behind D1 when D2 then drove forward and struck D1. |
| 3 | 09/28/2017 | Thursday | 5:03 PM | Rear-end | Property Damage Only | Daylight | Clear | Dry | 19 | 26 | | D1: (Inattention) / D2: (No improper driving) | D2 was stopped on Route 124 traveling southbound. D1 also traveling southbound on Route 124 failed to stop and rear ended D2. |
| 4 | 10/18/2017 | Wednesday | 6:50 PM | Angle | Injury | Dark/ Lighted Roadway | Clear | Dry | 61 | 32 | Unknown | D1: Unknown / D2: Unknown | V1 was traveling east on Queen Anne Road and V2 was traveling north on Route 124. Both drivers claim they had the green light and therefore proceeded through the intersection. V1 and V2 collided. |
| 5 | 03/22/2018 | Thursday | 10:04 AM | Angle | Property Damage Only | Daylight | Snow | Wet | 49 | 62 | | D1: Distracted / D2: No Improper driving | D1 was traveling south on Route 124 and failed to stop for redlight. D1 struck D2 who was traveling west on Queen Anne Road. |
| 6 | 06/30/2018 | Saturday | 4:57 PM | Angle | Property Damage Only | Daylight | Clear | Dry | 33 | 37 | | D1: No Improper driving / D2: Failed to yield right of way | D1 was traveling southbound on Route 124. D2 was stopped on Queen Anne Road eastbound. The signal was in flashing mode due to a malfunction but was fixed at this moment and D1 was given a green light. As D1 continued southbound D2 also continued into the intersection and D1 and D2 collided. |
| 7 | 08/15/2018 | Wednesday | 7:31 AM | Angle | Injury | Daylight | Cloudy | Dry | 34 | 55 | | D1: Failure to yield right of way / D2: No improper driving | D1 was traveling south on Route 124 and attempted turning left onto Queen Anne Road. D2 was travelling north on Route 124. D1 failed to yield the right of way and crashed into D2. |
| 8 | 01/18/2019 | Friday | 3:49 PM | Angle | Property Damage Only | Daylight | Cloudy | Dry | 23 | 17 | | D1: No improper driving / D2: Failure to yield right of way | D1 was traveling west on Queen Anne Road and took a right turn onto Route 124 northbound. D2 was traveling east on Queen Anne Road and took a left turn onto Route 124 northbound. As D1 and D2 were turning they collided. |
| 9 | 04/11/2019 | Thursday | 3:58 PM | Rear-end | Property Damage Only | Daylight | Clear | Dry | 19 | 59 | | D1: Inattention / D2: No improper driving | D1 was traveling southbound on Route 124 and struck the rear of D2 who was at a complete stop (for a school bus with flashing lights). D1 continued to strike a mailbox, pine tree, and telephone box near 244 Pleasant Lake Avenue. |
| 10 | 07/03/2019 | Wednesday | 12:14 PM | Rear-end | Injury | Daylight | Clear | Dry | 46 | 49 | 62 | D1: (No improper driving) / D2: (Followed too closely) / D3: (Followed too closely) | D1 was stopped on Route 124 southbound waiting for a vehicle to turn into Pleasant Lake Medical. D2 and D3 were also traveling southbound on Route 124. D3 was not able to stop and struck D2 in the rear causing them to move forward and strike D1 in the rear. |
| 11 | 08/11/2019 | Sunday | 11:28 AM | Rear-end | Injury | Daylight | Clear | Dry | 39 | 34 | | D1: Other Improper action / D2: No improper action | D1 was stopped behind D2 traveling northbound on Route 124 at the intersection with Queen Anne Road. D1 was distracted by his dog licking him and his foot slipped off the break causing him to roll forward and rear end D2. |
| 12 | 08/11/2019 | Sunday | 2:59 PM | Rear-end | Injury | Daylight | Clear | Dry | 26 | 21 | | D1: Other Improper action / D2: No improper action | D1 was stopped behind D2 traveling eastbound on Queen Anne Road. When the light turned green D1 did not wait for D2 to proceed before moving forward and therefore rear ended D2. |

Crash Data Summary
LOCATION: PLEASANT LAKE AVENUE AT QUEEN ANNE ROAD
January 2017 - December 2021

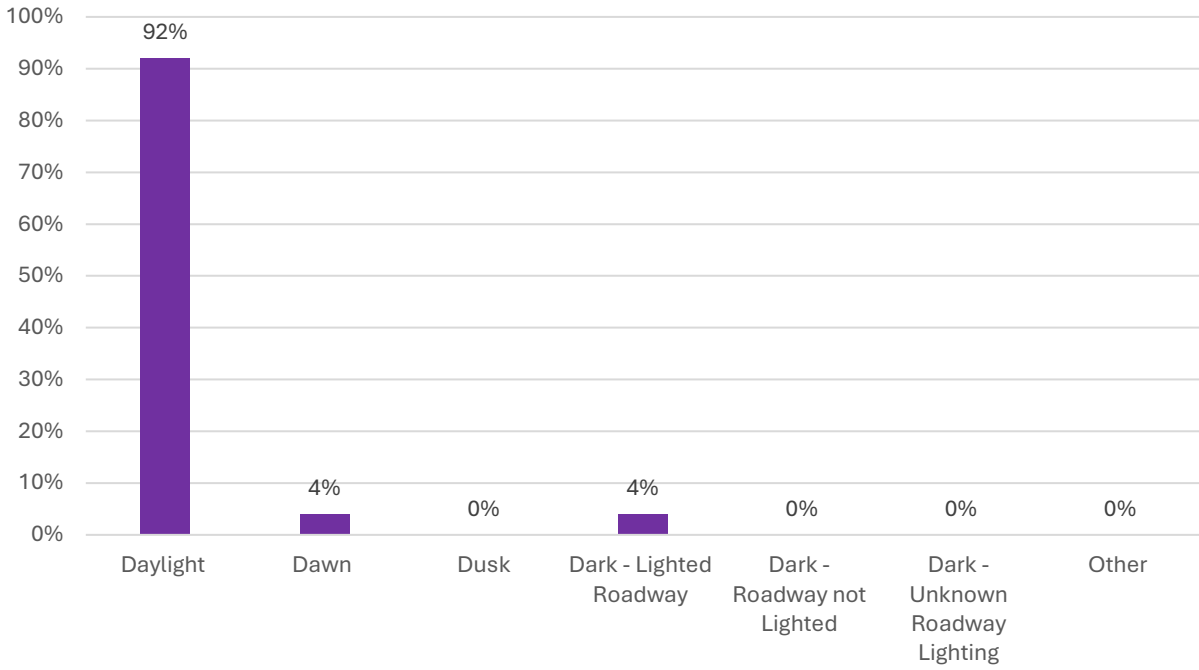
| Crash Diagram Reference # | Crash Date | Crash Day | Crash Time | Manner of Collision | Injury Status | Light Conditions | Weather Conditions | Road Surface Condition | Driver Ages | | | Driver Contributing Circumstances | Comments |
|---------------------------|------------|-----------|------------|----------------------|----------------------|------------------|--------------------|------------------------|-------------|---------|---------|--|--|
| | | | | | | | | | | | | | |
| 13 | 09/14/2019 | Saturday | 8:57 AM | Single Vehicle Crash | Injury | Daylight | Clear | Dry | 70 | | | D1: (Failure to keep in proper lane or running off road),(Illness) | V1 was traveling southbound on Route 124 and is believed to have had a medical emergency causing the driver to cross over the centerline, go off the roadway, and strike a tree near 242 Pleasant Lake Avenue. |
| 14 | 02/10/2020 | Monday | 3:31 PM | Rear-end | Injury | Daylight | Rain | Wet | 30 | 50 | | D1: Followed too closely, inattention / D2: No improper driving | V1 and V2 were traveling northbound on Route 124 near 253 Pleasant Lake Avenue. V2 a school bus stopped to let a child off the bus and was struck by V1 whose driver admitted to following too closely. |
| 15 | 05/19/2020 | Tuesday | 4:19 PM | Angle | Property Damage Only | Daylight | Clear | Dry | 17 | 53 | | D1: Failed to yield right of way / D2: No improper driving | D2 was traveling southbound on Route 124 through the intersection with Queen Anne Road when they were struck by D1 who failed to yield the right of way when turning left from Route 124 northbound onto Queen Anne Road westbound. |
| 16 | 06/06/2020 | Saturday | 5:18 PM | Single Vehicle Crash | Property Damage Only | Daylight | Clear | Dry | 57 | Unknown | Unknown | D1: Inattention, Distracted | D1 was driving southbound on Route 124 through the intersection with Queen Anne Road was distracted from spilling coffee ran off the road into the parking lot for 439 Queen Anne Road and struck two parked vehicles. |
| 17 | 06/17/2020 | Wednesday | 8:25 AM | Angle | Property Damage Only | Daylight | Clear | Dry | 23 | 32 | | D1: Failed to yield right of way / D2: No improper driving | D1 was traveling south on Route 124 and attempted turning left onto Queen Anne Road. D2 was travelling north on Route 124. D1 failed to yield the right of way and crashed into D2. |
| 18 | 02/12/2021 | Friday | 4:15 PM | Single Vehicle Crash | Property Damage Only | Daylight | Cloudy | Dry | 36 | Unknown | | D1: Distracted | D1 (vehicle with a trailer) was turning right from Route 124 southbound onto Queen Anne Road westbound, oversteered and struck a snowbank and utility pole. |
| 19 | 5/28/2021 | Friday | 8:13 AM | Rear-end | Property Damage Only | Daylight | Clear | Dry | 28 | 38 | | D1: Followed too closely / D2: No improper driving | D1 was stopped at the red light facing east on Queen Anne Road. D2 also traveling east on Queen Anne Road failed to stop in time and rear ended D1. D2 stated they may have been distracted by a child in the vehicle |
| 20 | 6/8/2021 | Tuesday | 2:36 PM | Rear-end | Injury | Daylight | Clear | Dry | 79 | 76 | | D1: Inattention/ D2: No improper driving | D2 was stopped on Route 124 at Queen Anne Road traveling southbound. D1 also traveling southbound on Route 124 failed to stop and rear ended D2. |
| 21 | 8/10/2021 | Tuesday | 9:01 AM | Angle | Injury | Daylight | Cloudy | Dry | 26 | 61 | | D1: Inattention, Disregarding traffic signs, signals, road marks / D2: No improper driving | D2 was stopped on Queen Anne Road eastbound at the intersection with Route 124. When the light turned green D2 proceeded forward and was struck by D1 who ran the red light (according to witness) traveling southbound on Route 124. |
| 22 | 8/16/2021 | Monday | 6:26 AM | Rear-end | Property Damage Only | Dawn | Clear | Dry | 46 | 57 | | D1: Followed too closely / D2: No improper driving | D2 (tractor-trailer) stopped on Route 124 at Queen Anne Road traveling southbound for a red light. D1 also traveling southbound on Route 124 failed to stop and rear ended D2. D1 stated they did not see the light change due to the truck size. |
| 23 | 11/10/2021 | Wednesday | 2:47 PM | Angle | Property Damage Only | Daylight | Clear | Dry | 23 | 17 | | D1: No Improper driving / D2: Failed to yield right of way | D1 was traveling north on Route 124. D2 was traveling west on Queen Anne Road and failed to yield the right of way when turning right on red and struck D1. |

Summaries based on crash reports obtained from the Harwich Police Department.

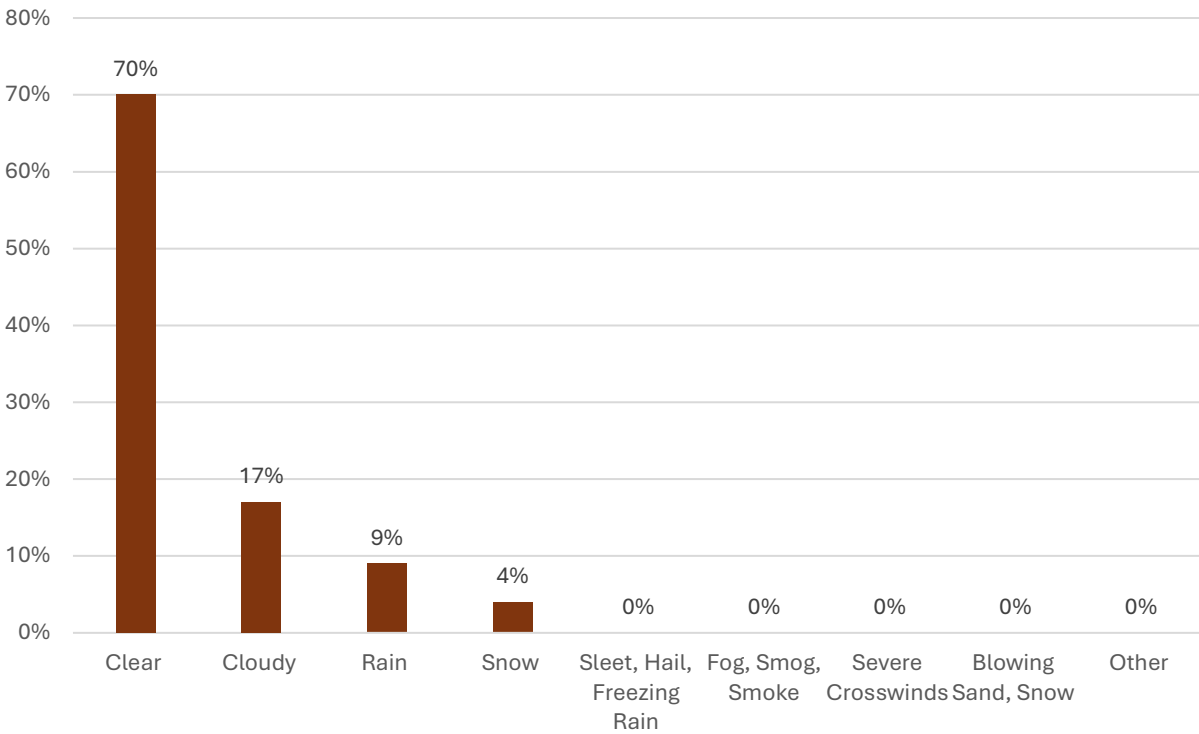




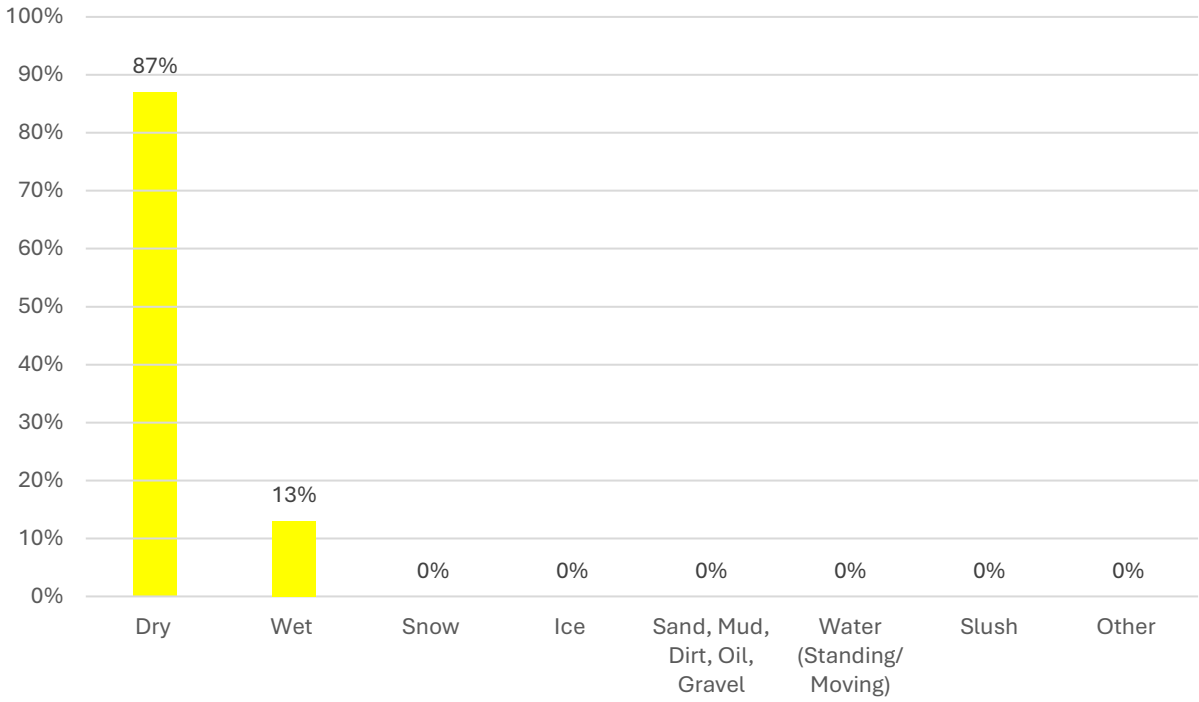
Crash Light Condition



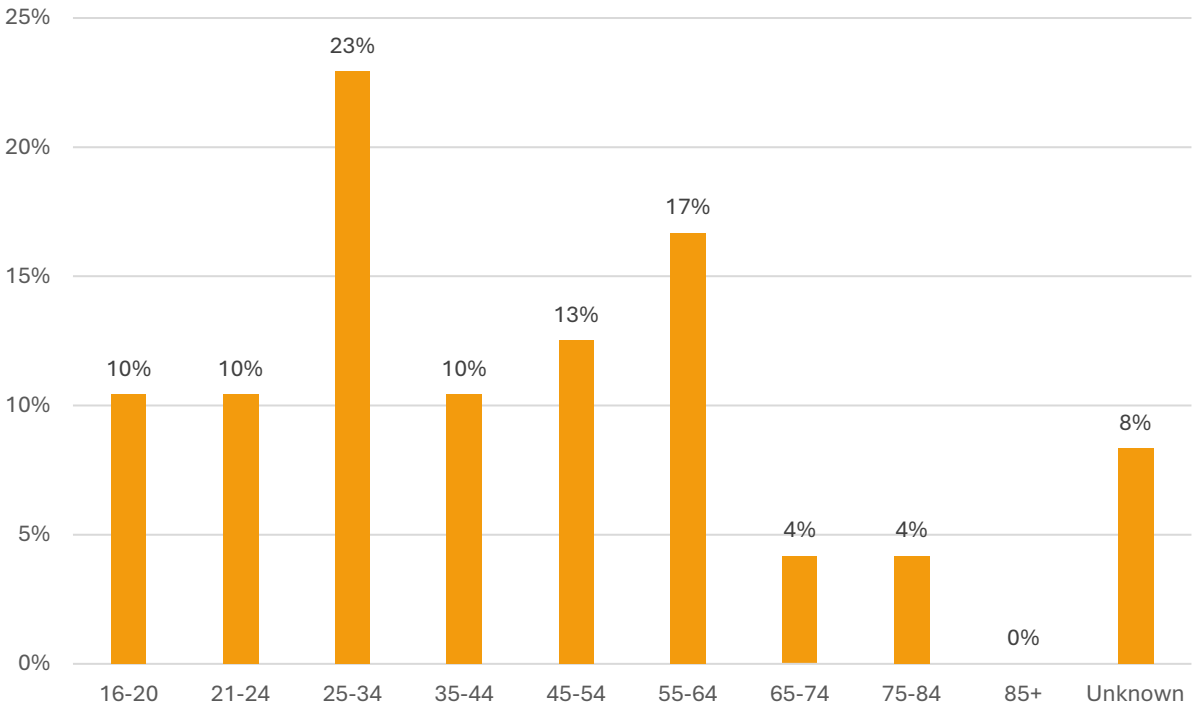
Crash Weather Condition



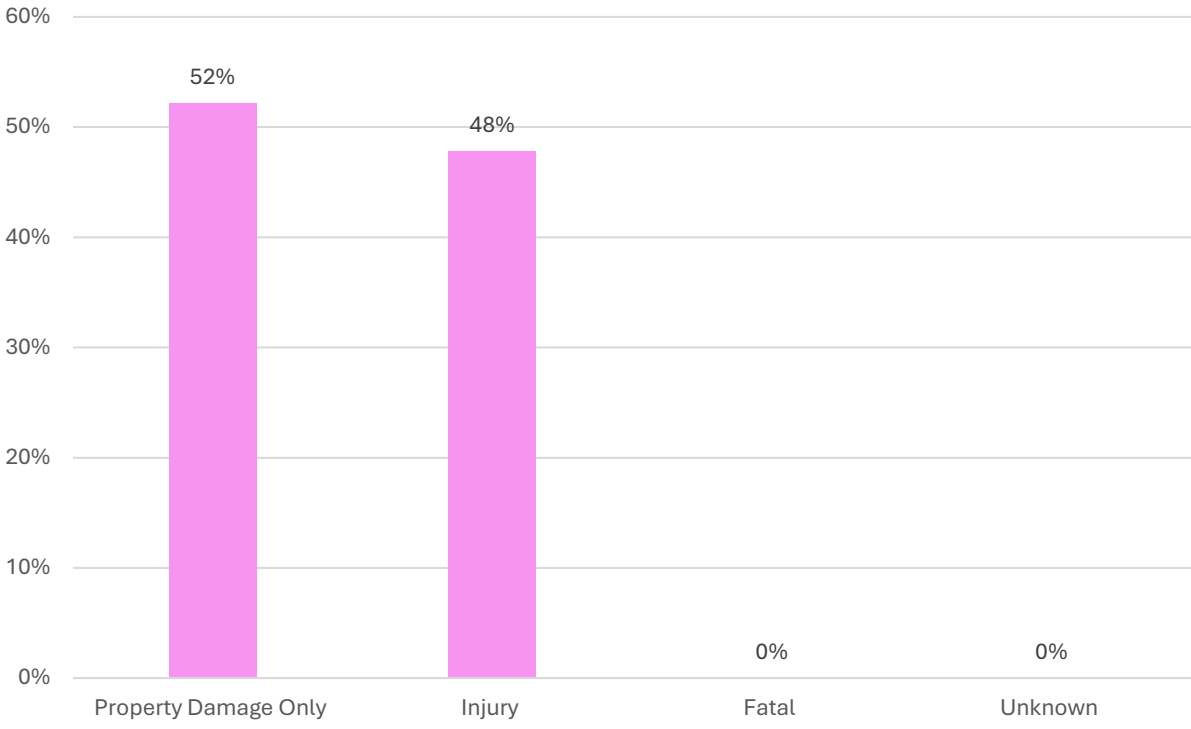
Crash Road Surface



Driver Age



Crash Severity



Accurate Counts
978-664-2565

97610001

Location : Queen Anne Road
Location : West of Rebecca Road
City/State: Harwich, MA
Direction: WB

| 7/19/2023 | 0 - 15 | > 15 - | > 20 - | > 25 - | > 30 - | > 35 - | > 40 - | > 45 - | > 50 - | > 55 - | > 60 - | > 65 - | > 70 | Total |
|-----------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|------|-------|
| Time | MPH | 20 MPH | 25 MPH | 30 MPH | 35 MPH | 40 MPH | 45 MPH | 50 MPH | 55 MPH | 60 MPH | 65 MPH | 70 MPH | MPH | |
| 12:00 AM | 0 | 0 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 |
| 1:00 | 0 | 0 | 2 | 2 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 |
| 2:00 | 0 | 0 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 |
| 3:00 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 |
| 4:00 | 0 | 0 | 2 | 5 | 3 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 11 |
| 5:00 | 0 | 0 | 5 | 12 | 11 | 2 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 31 |
| 6:00 | 0 | 0 | 8 | 61 | 42 | 23 | 2 | 2 | 0 | 0 | 0 | 0 | 0 | 138 |
| 7:00 | 0 | 1 | 22 | 112 | 76 | 18 | 7 | 2 | 0 | 0 | 0 | 0 | 1 | 239 |
| 8:00 | 0 | 1 | 40 | 94 | 91 | 27 | 5 | 1 | 0 | 1 | 0 | 0 | 0 | 260 |
| 9:00 | 1 | 0 | 13 | 69 | 69 | 14 | 6 | 0 | 0 | 1 | 0 | 0 | 0 | 173 |
| 10:00 | 0 | 2 | 30 | 89 | 61 | 24 | 2 | 0 | 1 | 1 | 0 | 0 | 0 | 210 |
| 11:00 | 1 | 0 | 28 | 93 | 66 | 21 | 5 | 0 | 0 | 0 | 0 | 0 | 0 | 214 |
| 12:00 PM | 1 | 0 | 25 | 72 | 79 | 20 | 5 | 0 | 0 | 0 | 0 | 0 | 0 | 202 |
| 1:00 | 2 | 0 | 25 | 77 | 53 | 13 | 5 | 0 | 0 | 1 | 0 | 0 | 0 | 176 |
| 2:00 | 0 | 0 | 10 | 91 | 78 | 31 | 2 | 0 | 0 | 1 | 0 | 0 | 0 | 213 |
| 3:00 | 0 | 0 | 15 | 76 | 72 | 29 | 7 | 2 | 0 | 0 | 0 | 0 | 0 | 201 |
| 4:00 | 1 | 0 | 22 | 81 | 76 | 47 | 7 | 3 | 0 | 0 | 0 | 0 | 0 | 237 |
| 5:00 | 0 | 0 | 9 | 50 | 46 | 23 | 4 | 1 | 0 | 0 | 0 | 0 | 0 | 133 |
| 6:00 | 1 | 0 | 11 | 31 | 35 | 15 | 5 | 0 | 0 | 0 | 0 | 0 | 0 | 98 |
| 7:00 | 0 | 0 | 5 | 36 | 18 | 5 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 65 |
| 8:00 | 0 | 1 | 5 | 23 | 18 | 2 | 2 | 1 | 0 | 0 | 1 | 0 | 0 | 53 |
| 9:00 | 0 | 1 | 4 | 19 | 8 | 2 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 35 |
| 10:00 | 1 | 0 | 2 | 7 | 7 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 20 |
| 11:00 | 0 | 0 | 1 | 2 | 6 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 10 |
| Total | 8 | 6 | 285 | 1108 | 917 | 322 | 66 | 12 | 2 | 5 | 1 | 0 | 1 | 2733 |

| | | | | |
|----------------------|-------|------|------|------|
| Percentile | 15th | 50th | 85th | 95th |
| Speed | 26 | 30 | 35 | 38 |
| Mean Speed (Average) | 30.4 | | | |
| 10 MPH Pace Speed | 25-34 | | | |
| Number in Pace | 2012 | | | |
| Percent in Pace | 73.6% | | | |
| Number > 30 MPH | 1326 | | | |
| Percent > 30 MPH | 48.5% | | | |

Accurate Counts
978-664-2565

97610001

Location : Queen Anne Road
Location : West of Rebecca Road
City/State: Harwich, MA
Direction: WB

| 7/20/2023 Time | 0 - 15 MPH | > 15 - 20 MPH | > 20 - 25 MPH | > 25 - 30 MPH | > 30 - 35 MPH | > 35 - 40 MPH | > 40 - 45 MPH | > 45 - 50 MPH | > 50 - 55 MPH | > 55 - 60 MPH | > 60 - 65 MPH | > 65 - 70 MPH | > 70 MPH | Total |
|-------------------|---------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|-------------|-------|
| 12:00 AM | 0 | 1 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 |
| 1:00 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 2:00 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 |
| 3:00 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 |
| 4:00 | 0 | 0 | 1 | 4 | 3 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 10 |
| 5:00 | 0 | 0 | 5 | 9 | 13 | 4 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 32 |
| 6:00 | 0 | 0 | 9 | 65 | 35 | 17 | 2 | 1 | 1 | 0 | 0 | 0 | 0 | 130 |
| 7:00 | 0 | 1 | 16 | 69 | 84 | 29 | 8 | 1 | 0 | 1 | 0 | 0 | 0 | 209 |
| 8:00 | 0 | 5 | 33 | 113 | 99 | 29 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 283 |
| 9:00 | 1 | 3 | 19 | 73 | 81 | 22 | 3 | 0 | 0 | 1 | 0 | 0 | 0 | 203 |
| 10:00 | 0 | 4 | 26 | 70 | 61 | 23 | 4 | 1 | 0 | 2 | 0 | 0 | 0 | 191 |
| 11:00 | 0 | 0 | 21 | 83 | 78 | 28 | 4 | 3 | 0 | 0 | 0 | 0 | 0 | 217 |
| 12:00 PM | 0 | 3 | 22 | 82 | 73 | 21 | 4 | 1 | 0 | 0 | 0 | 0 | 0 | 206 |
| 1:00 | 2 | 1 | 30 | 85 | 45 | 17 | 4 | 1 | 1 | 0 | 0 | 0 | 0 | 186 |
| 2:00 | 0 | 1 | 24 | 92 | 71 | 23 | 6 | 0 | 0 | 0 | 1 | 0 | 0 | 218 |
| 3:00 | 0 | 5 | 37 | 99 | 76 | 31 | 6 | 0 | 1 | 0 | 0 | 0 | 0 | 255 |
| 4:00 | 0 | 5 | 14 | 80 | 85 | 46 | 6 | 3 | 0 | 0 | 0 | 0 | 0 | 239 |
| 5:00 | 0 | 0 | 20 | 72 | 68 | 37 | 6 | 1 | 0 | 0 | 0 | 1 | 0 | 205 |
| 6:00 | 0 | 1 | 9 | 40 | 25 | 19 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 97 |
| 7:00 | 0 | 2 | 8 | 26 | 18 | 11 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 65 |
| 8:00 | 0 | 0 | 10 | 23 | 16 | 2 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 52 |
| 9:00 | 0 | 0 | 12 | 11 | 15 | 3 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 42 |
| 10:00 | 1 | 1 | 1 | 9 | 4 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 18 |
| 11:00 | 0 | 0 | 1 | 0 | 2 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 |
| Total | 4 | 33 | 320 | 1107 | 953 | 369 | 61 | 15 | 3 | 4 | 1 | 1 | 0 | 2871 |

| | | | | |
|----------------------|-------|------|------|------|
| Percentile | 15th | 50th | 85th | 95th |
| Speed | 25 | 30 | 35 | 38 |
| Mean Speed (Average) | 30.3 | | | |
| 10 MPH Pace Speed | 25-34 | | | |
| Number in Pace | 2047 | | | |
| Percent in Pace | 71.3% | | | |
| Number > 30 MPH | 1407 | | | |
| Percent > 30 MPH | 49.0% | | | |

| | | | | | | | | | | | | | | |
|----------------------|-------|----|-----|------|------|------|------|----|---|---|---|---|---|------|
| Grand Total | 12 | 39 | 605 | 2215 | 1870 | 691 | 127 | 27 | 5 | 9 | 2 | 1 | 1 | 5604 |
| Percentile | 15th | | | | 50th | 85th | 95th | | | | | | | |
| Speed | 25 | | | | 30 | 35 | 38 | | | | | | | |
| Mean Speed (Average) | 30.4 | | | | | | | | | | | | | |
| 10 MPH Pace Speed | 25-34 | | | | | | | | | | | | | |
| Number in Pace | 4060 | | | | | | | | | | | | | |
| Percent in Pace | 72.4% | | | | | | | | | | | | | |
| Number > 30 MPH | 2733 | | | | | | | | | | | | | |
| Percent > 30 MPH | 48.8% | | | | | | | | | | | | | |

Accurate Counts
978-664-2565

97610001

Location : Queen Anne Road
Location : West of Rebecca Road
City/State: Harwich, MA
Direction: EB

| 7/19/2023 | 0 - 15 | > 15 - | > 20 - | > 25 - | > 30 - | > 35 - | > 40 - | > 45 - | > 50 - | > 55 - | > 60 - | > 65 - | > 70 | Total |
|-----------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|------|-------|
| Time | MPH | 20 MPH | 25 MPH | 30 MPH | 35 MPH | 40 MPH | 45 MPH | 50 MPH | 55 MPH | 60 MPH | 65 MPH | 70 MPH | MPH | |
| 12:00 AM | 0 | 0 | 0 | 4 | 5 | 1 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 13 |
| 1:00 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 |
| 2:00 | 0 | 0 | 0 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 |
| 3:00 | 0 | 0 | 0 | 1 | 2 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 |
| 4:00 | 0 | 0 | 0 | 0 | 2 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 5 |
| 5:00 | 0 | 0 | 1 | 4 | 15 | 11 | 4 | 1 | 0 | 0 | 0 | 0 | 0 | 36 |
| 6:00 | 0 | 0 | 1 | 5 | 35 | 27 | 15 | 3 | 0 | 0 | 0 | 0 | 0 | 86 |
| 7:00 | 0 | 0 | 6 | 17 | 64 | 56 | 13 | 1 | 0 | 0 | 0 | 1 | 0 | 158 |
| 8:00 | 1 | 0 | 5 | 35 | 88 | 57 | 23 | 0 | 0 | 0 | 0 | 1 | 0 | 210 |
| 9:00 | 0 | 0 | 3 | 21 | 83 | 52 | 10 | 1 | 0 | 0 | 0 | 0 | 0 | 170 |
| 10:00 | 0 | 2 | 8 | 23 | 96 | 66 | 10 | 1 | 0 | 0 | 0 | 0 | 0 | 206 |
| 11:00 | 0 | 0 | 5 | 43 | 89 | 60 | 23 | 0 | 0 | 0 | 0 | 0 | 0 | 220 |
| 12:00 PM | 0 | 2 | 6 | 40 | 99 | 53 | 16 | 1 | 0 | 0 | 0 | 0 | 0 | 217 |
| 1:00 | 0 | 0 | 12 | 29 | 95 | 63 | 15 | 4 | 1 | 0 | 0 | 0 | 0 | 219 |
| 2:00 | 0 | 0 | 9 | 59 | 120 | 64 | 16 | 3 | 0 | 0 | 0 | 0 | 0 | 271 |
| 3:00 | 0 | 0 | 9 | 64 | 160 | 136 | 19 | 4 | 1 | 0 | 2 | 0 | 0 | 395 |
| 4:00 | 1 | 2 | 12 | 55 | 212 | 147 | 31 | 3 | 0 | 1 | 0 | 0 | 0 | 464 |
| 5:00 | 1 | 0 | 3 | 36 | 125 | 134 | 27 | 3 | 2 | 0 | 1 | 0 | 0 | 332 |
| 6:00 | 0 | 0 | 3 | 15 | 44 | 53 | 17 | 3 | 0 | 0 | 0 | 1 | 0 | 136 |
| 7:00 | 0 | 1 | 1 | 9 | 39 | 20 | 10 | 4 | 2 | 0 | 0 | 0 | 0 | 86 |
| 8:00 | 0 | 0 | 1 | 11 | 33 | 18 | 5 | 2 | 0 | 0 | 0 | 0 | 0 | 70 |
| 9:00 | 0 | 0 | 3 | 3 | 11 | 9 | 5 | 2 | 0 | 0 | 1 | 0 | 0 | 34 |
| 10:00 | 0 | 0 | 4 | 4 | 9 | 7 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 27 |
| 11:00 | 0 | 0 | 0 | 0 | 7 | 9 | 4 | 0 | 1 | 0 | 0 | 0 | 0 | 21 |
| Total | 3 | 7 | 92 | 479 | 1435 | 1047 | 268 | 36 | 9 | 2 | 4 | 3 | 0 | 3385 |

| | |
|----------------------|-------|
| Percentile | 15th |
| Speed | 30 |
| Mean Speed (Average) | 34.1 |
| 10 MPH Pace Speed | 30-39 |
| Number in Pace | 2471 |
| Percent in Pace | 73.0% |
| Number > 30 MPH | 2804 |
| Percent > 30 MPH | 82.8% |

Accurate Counts
978-664-2565

Location : Queen Anne Road
Location : West of Rebecca Road
City/State: Harwich, MA
Direction: EB

97610001

| 7/20/2023 Time | 0 - 15 MPH | > 15 - 20 MPH | > 20 - 25 MPH | > 25 - 30 MPH | > 30 - 35 MPH | > 35 - 40 MPH | > 40 - 45 MPH | > 45 - 50 MPH | > 50 - 55 MPH | > 55 - 60 MPH | > 60 - 65 MPH | > 65 - 70 MPH | > 70 MPH | Total |
|-------------------|---------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|-------------|-------|
| 12:00 AM | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 4 |
| 1:00 | 0 | 0 | 0 | 1 | 2 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 |
| 2:00 | 0 | 0 | 0 | 1 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 |
| 3:00 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 |
| 4:00 | 0 | 0 | 0 | 0 | 1 | 5 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 7 |
| 5:00 | 0 | 0 | 2 | 4 | 13 | 6 | 8 | 1 | 1 | 0 | 0 | 0 | 0 | 35 |
| 6:00 | 0 | 0 | 0 | 11 | 33 | 28 | 20 | 2 | 0 | 0 | 0 | 0 | 0 | 94 |
| 7:00 | 0 | 0 | 5 | 22 | 74 | 52 | 11 | 3 | 0 | 0 | 0 | 0 | 0 | 167 |
| 8:00 | 0 | 2 | 7 | 18 | 75 | 57 | 17 | 5 | 0 | 0 | 0 | 0 | 0 | 181 |
| 9:00 | 0 | 0 | 5 | 30 | 74 | 63 | 15 | 1 | 0 | 0 | 0 | 1 | 0 | 189 |
| 10:00 | 0 | 0 | 9 | 30 | 114 | 73 | 12 | 1 | 1 | 0 | 0 | 0 | 0 | 240 |
| 11:00 | 0 | 1 | 6 | 47 | 120 | 99 | 19 | 2 | 0 | 0 | 0 | 1 | 0 | 295 |
| 12:00 PM | 0 | 1 | 5 | 46 | 97 | 57 | 13 | 3 | 0 | 0 | 0 | 0 | 0 | 222 |
| 1:00 | 0 | 2 | 14 | 37 | 95 | 74 | 14 | 0 | 0 | 0 | 0 | 0 | 0 | 236 |
| 2:00 | 0 | 1 | 4 | 41 | 111 | 67 | 18 | 1 | 0 | 0 | 1 | 0 | 0 | 244 |
| 3:00 | 2 | 0 | 7 | 54 | 194 | 115 | 16 | 5 | 0 | 0 | 0 | 0 | 0 | 393 |
| 4:00 | 0 | 0 | 4 | 49 | 151 | 132 | 33 | 4 | 0 | 0 | 0 | 0 | 0 | 373 |
| 5:00 | 0 | 1 | 5 | 44 | 133 | 124 | 32 | 3 | 0 | 0 | 0 | 0 | 0 | 342 |
| 6:00 | 0 | 0 | 1 | 35 | 68 | 61 | 14 | 3 | 0 | 0 | 0 | 0 | 0 | 182 |
| 7:00 | 0 | 0 | 1 | 21 | 33 | 30 | 12 | 1 | 0 | 0 | 1 | 0 | 0 | 99 |
| 8:00 | 0 | 0 | 2 | 10 | 22 | 25 | 4 | 2 | 0 | 0 | 0 | 0 | 0 | 65 |
| 9:00 | 0 | 1 | 2 | 7 | 24 | 11 | 2 | 1 | 1 | 0 | 0 | 0 | 0 | 49 |
| 10:00 | 0 | 0 | 0 | 3 | 15 | 5 | 4 | 1 | 0 | 0 | 0 | 0 | 0 | 28 |
| 11:00 | 0 | 0 | 0 | 1 | 3 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 7 |
| Total | 3 | 9 | 79 | 513 | 1453 | 1091 | 267 | 40 | 3 | 0 | 2 | 2 | 0 | 3462 |

Percentile 15th 50th 85th 95th
Speed 30 34 38 42
Mean Speed (Average) 34.1
10 MPH Pace Speed 30-39
Number in Pace 2532
Percent in Pace 73.1%
Number > 30 MPH 2858
Percent > 30 MPH 82.6%

| | | | | | | | | | | | | | | |
|----------------------|---|----|-----|-------|------|------|------|----|----|---|---|---|---|------|
| Grand Total | 6 | 16 | 171 | 992 | 2888 | 2138 | 535 | 76 | 12 | 2 | 6 | 5 | 0 | 6847 |
| Percentile | | | | 15th | 50th | 85th | 95th | | | | | | | |
| Speed | | | | 30 | 34 | 38 | 42 | | | | | | | |
| Mean Speed (Average) | | | | 34.1 | | | | | | | | | | |
| 10 MPH Pace Speed | | | | 30-39 | | | | | | | | | | |
| Number in Pace | | | | 5003 | | | | | | | | | | |
| Percent in Pace | | | | 73.1% | | | | | | | | | | |
| Number > 30 MPH | | | | 5662 | | | | | | | | | | |
| Percent > 30 MPH | | | | 82.7% | | | | | | | | | | |

Appendix D. Road Safety Audit References

Road Safety Audit References

FHWA Office of Safety - Proven Safety Countermeasures, U.S. Department of Transportation, Federal Highway Administration <https://safety.fhwa.dot.gov/provencountermeasures/>.

Road Safety Audits, A Synthesis of Highway Practice. NCHRP Synthesis 336. Transportation Research Board, National Cooperative Highway Research Program, 2004.

Road Safety Audits. U.S. Department of Transportation, Federal Highway Administration, <https://safety.fhwa.dot.gov/rsa/>

FHWA Road Safety Audit Guidelines. U.S. Department of Transportation, Federal Highway Administration, 2006.

Road Safety Audit, 2nd edition. Austroads, 2000.

Road Safety Audits. ITE Technical Council Committee 4S-7. Institute of Transportation Engineers, February 1995.